Adding Polymer to Increase Trunk Sewer Flow Capacity at Resort Municipality of Whistler – Looking Back

2007 – 2009 Preparations…

2010 Winter Olympic and Paralympic Games
February 12\textsuperscript{th} to 18\textsuperscript{th} and March 12\textsuperscript{th} to 21\textsuperscript{st}

Resort Municipality of Whistler (RMOW)
Whistler Trunk Sewers and Laterals

Total Length = 9 km, 5.6mi
Attendance at the Party

Population Forecast: 55,000 to 70,000 People

Some past perspectives:

- Christmas Week population
  34,000 (80% occupancy)

- New Years Eve population
  40,000 (93% occupancy)

- Some rain occurs nearly every year in February
- Probability of significant I&I (rain-on-snow event) in February = 20%
Critical Elevation Sections

Trunk Sewer Profile

- Ground Level
- Peak Pop’n 5yr I&I Event
- Peak Pop’n No I&I

Areas of Potential Flooding

Critical Section

Distance from WWTP (m)

Elevation (m)

655 660 665 670 675 680

6,500 7,000 7,500 8,000 8,500
Conventional Solutions

The Options:

- Peak Storage Tank
- Temporary Bypass Pump Stations
- Upsizing / Twinning
- Pressured Trunk Sewer
- Pipe Bursting
- Water Conservation

Expensive 1 Show Only?

Time Constraints
Selected Option: Drag-reducing Polymer

Ideal Polymer Properties

- High molecular weight
- Highly charged anionic polyacrylamide
- **Long chained, short branches**
- Readily dissolved
- Two polymers selected for demonstration project trials
Dosing Locations

Dosing Location #1 (force main, 1/3 of trunk flow)

Dosing Location #2 (Gravity, 1/3 of trunk flow)

To WWTP 4 miles

Main Village
Polymer Dosing Methods


Two dosing locations:
- Complex collection network
- Target high% of trunk flow
- Maximize mixing
Did the Polymer Work?

% Change: Velocity and Depth

- Dosing turned on
- No Polymer Dosing
- Polymer Dosing

% of Historical Normalized Value

21 Sun Dec 2008

October 19, 2011
Easy on the Pedal!

“Oops too much dosed too fast”

Started Dosing

Stopped Dosing
Strategy

• Live monitoring during games

• Observations of flow and manhole levels

• Standby for rain-on-snow event

• Response protocols established to allow ramping up to dosing set points…**SLOWLY**
Flow During the Games

Trunk Sewer Flow Depth During Olypic Games

- Depth (m)
- 675mm Diameter

Manageable Population Levels and No 5-Year Storm

Olympics Start

Olympics End

10-Feb 14-Feb 18-Feb 22-Feb 26-Feb 2-Mar

October 19, 2011
Polymer Dosing Run at End of the Games

Velocity
Depth

Depth (m) | Velocity (m/s)
---------|-------------
Begin Polymer Dosing
Stop Polymer Dosing
Temporary Effect Of Surge Wave

Time
Feb 26 3am 6am 12pm 6pm Feb 27 3am
The Impacts of Dosing: the Data

But, what does this mean?
The Impacts of Dosing: the Results

Changes in Capacity During the High-Flow Run

| VELOCITY | 30% increase |
| DEPTH    | 20% decrease |
Typical representation:
• E.g., half-full 600 mm pipe
• Capacity increase of:
  ~15%.
Recalling:

- Lower flows observed:
  - Lower populations
  - No 5yr storms
- Mechanism of action at pipe wall
- Whistler results support others’ experience: ~30% capacity increase in full pipe
<table>
<thead>
<tr>
<th>Trunk Sewer Flow</th>
<th>15 - 20 ML/d or 4 – 5 MGD</th>
</tr>
</thead>
<tbody>
<tr>
<td>O&amp;M costs</td>
<td>$0.35 / m³ or $0.0013 / gal</td>
</tr>
<tr>
<td>- Depends on polymer use (full time, dose peak flow only etc.)</td>
<td></td>
</tr>
</tbody>
</table>
What Did We learn?

• Cost-effective solution:
  • Temporarily increase capacity in existing infrastructure.
  • Otherwise displacing considerable capital costs.

• Select application locations carefully to maximize polymer’s beneficial effects.
  • Use real-time monitoring.

• Be aware of flow restrictions.
  • Establish and use early-warning flow/level monitoring alarms.
  • Start polymer dosing early and ramp up slowly.

• Innovative and successful application in a complex collection network and environment.
This project was successful because of the work of the following Resort Municipality of Whistler staff:

- Joe Paul
- Chris Wike
- Andrew Tucker
- James Hallisey
- Brian Barnett
- Ron Sander
Thank You. Questions?

John Hart, M.A.Sc., P.Eng. – Project Manager
Lucy Cotter, M.A.Sc., P.Eng.
Jason Vine, M.A.Sc., P.Eng.

Kerr Wood Leidal Associates Ltd.
200 – 4185A Still Creek Drive
Burnaby, British Columbia
V5C 6G9

Telephone: (604) 294 – 2088

Email: jhart@kwl.ca